

REMARKS

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims.

Status of the Claims

In the present Amendment, claims 1-3 have been amended and claims 16-18 have been added. Also, claims 6, 8 and 12 are canceled without prejudice or disclaimer of the subject matter contained therein. Thus, claims 1-5, 7, 9-11 and 13-18 are pending in the present application.

No new matter has been added by way of these amendments because each amendment is supported by the present specification and canceled claims. For example, the amendments to claims 1-3 have support in (canceled) claims 6, 8 and 12, respectively (see also page 9, lines 18-19 of the specification), as well as in the present specification at page 10, starting at line 16.

Claims 16-18 have been added for the Examiner's consideration. Support for these claims is found in the present specification at least at page 8, line 15 to page 9, line 9, as well as at page 10, lines 4-8. No new matter has been added.

Based upon the above considerations, entry of the present amendment is respectfully requested.

In view of the following remarks, Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims. Applicants' previous arguments are rendered moot in view of the new rejections (see page 4 of the Office Action).

Issues Under 35 U.S.C. § 102(e)

Claims 1-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawada *et al.* '653 (U.S. Published Application No. 2002/0009653 A1) in view of Konuma '279 (U.S. Patent No. 6,127,279) or Foster '804 (U.S. Patent No. 6,387,804). Applicants respectfully traverse and reconsideration and withdrawal of both rejections are respectfully requested.

Distinctions Over Kawada '653 and Konuma '279

The cited primary reference of Kawada *et al.* '653 discloses a phase shift mask blank comprising a phase shifter film made of a molybdenum silicide oxide nitride (see, e.g., the Abstract). However, the instantly claimed phase shift mask blank comprises a phase shift film that has been treated with ozone water (which has been dissolved therein). In this respect, Kawada '653 fails to disclose ozone treatment.

The cited secondary reference of Konuma '279 is cited to account for the deficiencies of Kawada '653 as stated starting at page 3, line 12 of the Office Action. Konuma '279 discloses the following method:

5. A method of manufacturing semiconductor device comprising the steps of:
 - depositing a semiconductor film comprising amorphous silicon on an insulating surface of a substrate;
 - crystallizing said semiconductor film;
 - patterning the crystallizing semiconductor film into a plurality of semiconductor islands;
 - forming an insulating film over said plurality of semiconductor islands;
 - forming a conductive film on said insulating film;
 - forming a patterned mask on said conductive film;
 - treating said patterned mask with water comprising ozone dissolved in a concentration from 0.1 to 20 ppm; and then

etching said conductive film into gate electrodes in accordance with said patterned mask using a liquid etchant.

(Applicant's emphasis added).

Accordingly, Konuma '279 discloses that all of its semiconductor devices have patterned resist masks. Therefore, Konuma '279 does not disclose a phase shift film and Applicants note there are technical differences between the Konuma '279 disclosure and the present invention. In contrast to Konuma '279, the present invention is directed to a method of manufacturing a phase shift mask blank, wherein the ozone water is added to oxide a phase shift film and not a resist. A resist can be used for patterning a phase shift film after the ozone treatment (see pending claim 5). However, Applicants note the inconsistent disclosure in Konuma '279 with the primary reference of Kawada '653, as with the present invention, regarding this "patterned mask" and the phase shift mask blank as explained above.

Moreover, "a patterned mask" as disclosed in the cited Konuma '279 reference refers to a patterned mask for a lower film. Such a patterned mask is unrelated to a phase shift mask. In fact, a phase shift mask is an independent tool for photolithography wherein the patterned mask of Konuma '279 is not a photolithography tool. Further, the cited patterned mask in Konuma '279 is attached to the conductive film (which is further evidence that it is not the same as a phase shift mask). In addition, the instantly claimed phase shift film is not patterned when the film is still a part of the phase shift mask blank. In other words, the phase shift film is not patterned when the film is treated with ozone water, and the film is not treated with ozone water after the film was patterned. Therefore, Applicants respectfully submit that a *prima facie* case of

obviousness has not been established since Kawada '653 is improperly combined with Konuma '279.

U.S. case law squarely holds that a proper obviousness inquiry requires consideration of three factors: (1) the prior art reference (or references when combined) must teach or suggest all the claim limitations; (2) whether or not the prior art would have taught, motivated, or suggested to those of ordinary skill in the art that they should make the claimed invention (or practice the invention in case of a claimed method or process); and (3) whether the prior art establishes that in making the claimed invention (or practicing the invention in case of a claimed method or process), there would have been a reasonable expectation of success. *See In re Vaeck*, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). Also, the requisite motivation is lacking when the Examiner's proposed modification or combination renders a reference unsatisfactory for its intended purpose. *See re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); *see also* M.P.E.P. § 2143.01. Here, due to its description of the patterned resist masks, Konuma '279 (and/or Kawada '653) would be rendered unsatisfactory for its intended purpose if one of ordinary skill in the art was trying to achieve the present invention. Also, one of ordinary skill in the art lacks the requisite motivation to combine the disclosures of Kawada '653 and Konuma '279 since Konuma '279 is directed to manufacturing patterned resist masks, and not the methods of making phase shift films as instantly claimed.

Applicants further note another inconsistency between Kawada '653 and Konuma '279 such that the reasonable expectation of success and/or motivation is lacking. *Vaeck; supra*. This is because Konuma '279 provides the following description at column 11, lines 19-26:

The contact angle of the etching solution with respect to the photoresist surface is changed from approximately 30° (before the ozone water has flowed and after washing with pure water) into approximately 7° (after the ozone water has flowed), and thus the contact angle is greatly reduced by the contact with the ozone water. This represents by the fact that the surface energy of the photoresist surface is reduced by the contact of the ozone water with the resist surface.

Based on this description, the reason for the ozone treatment in the cited Konuma '279 reference is to reduce contact angle of the etching solution. However, in the present invention, oxidizing the phase shift film with ozone water protects against changes of phase difference and transmittance under the action of the chemical liquids used for cleaning and etching of the chromium-base film. Applicants note page 4, lines 3+ of the present specification. In other words, Konuma '279 does not even recognize the problems that the present invention solves (e.g., protection against phase difference and transmittance after cleaning of the film). Especially, in the case of a phase shift mask blank comprising a chromium-base film, the instantly produced phase shift film must have more of a stable resistance against an acidic solution, such as a chromium etchant, which is used for etching the chromium-base film. Applicants note that this is not considered a matter of recognizing another advantage. Instead, one of ordinary skill in the art would understand that Konuma '279 fails to describe or even recognize how to give, e.g., stable resistance against an acidic solution. In an attempt to achieve the claimed invention, the skilled artisan would not even refer to the Konuma '279 disclosure. Thus, Kawada '653 is being improperly combined with Konuma '279 for additional reasons.

In addition, Applicants respectfully submit that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior

art, and not based on applicant's disclosure. *See In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). That is not the case here because Konuma '279 only provides a description regarding ozone treatment to reduce the contact angle of the etching solution. Referring to the Konuma '279 disclosure would not help the skilled artisan to achieve the present invention.

Second, while patents are relevant as prior art for all they contain, they cannot be relied upon to teach embodiments that are not reasonably suggested to one having ordinary skill in the art. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804 (Fed. Cir. 1989). In the instant case, the skilled artisan could not reasonably infer from the above descriptions in the secondary reference that the manufacturing method of Konuma '279 would work for a phase shift mask. Again, Applicants note that the disclosed patterned mask is not even related to a phase shift mask, and that the phase shift mask of the present invention is not patterned when the film is still a part of the phase shift mask blank.

Thus, Applicants respectfully submit that a *prima facie* case of obviousness has not been established since not all requirements thereof (e.g., reasonable expectation of success; motivation) have been satisfied. Accordingly, reconsideration and withdrawal of the rejection of Kawada '653 plus Konuma '279 are respectfully requested.

Distinctions Over Kawada '653 and Foster '804

The deficiencies of Kawada '653 are discussed above. Foster '804 is cited as accounting for the deficiencies of Kawada '653, including its description of its sidewall spacers having silicon nitride (see the Office Action at page 4, line 3).

The cited secondary reference of Foster '804 discloses process wherein a metal silicide is formed on a transistor gate electrode and associated source/drain regions (see, e.g., column 3, starting at line 47). The formation of the metal silicide is avoided on a sidewall spacer (see the Abstract; column 3, lines 57-60). That is, the sidewall spacer made of silicon nitride is treated with a mixture of ozone and water for preventing the formation of the metal silicide. This treatment is not a passivation of silicide.

Applicants note that in the present method a metal silicide is the object that is treated with ozone water. Thus, Foster '804 discloses an improved "salicide" process of forming metal silicide contacts and a sidewall spacer made of a silicon nitride and is not directed to a metal silicide (see, e.g., the "Technical Field" section at column 1, line 12). Applicants also note that silicon nitride is not a metal silicide, wherein a silicide is a compound of metal and silicon. Thus, Foster '804 is technically different from the primary reference of Kawada '653 as well as being different from the present invention. Further, Foster '804 does not disclose a phase shift film.

Therefore, Foster '804 cannot be properly combined with Kawada '653 for several reasons, including those specified above. For example, a claimed combination cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose. *See* M.P.E.P. §§ 2143.01(see sections entitled "The Proposed Modification Cannot Render the Prior Art Unsatisfactory For Its Intended Purpose" and "The Proposed Modification Cannot Change the Principle of Operation of a Reference") and M.P.E.P. § 2145(III). Here, Foster '804 is directed to a salicide process and silicon nitride, and the Foster '804 method cannot be properly combined, or is not even compatible, with the Kawada '653 method.

As another example, Applicants again note that while patents are relevant as prior art for all they contain, they cannot be relied upon to teach embodiments that are not reasonably suggested to one having ordinary skill in the art. *Merck; supra*. In the instant case, the skilled artisan could not reasonably infer from the above descriptions in the secondary reference that the manufacturing method of Foster '804 would work for a phase shift mask, especially when considering how the claimed method involves a metal silicide that is treated with ozone water and Foster '804 discloses an improved silicide process of forming metal silicide contacts and a sidewall spacer made of a silicon nitride. Therefore, Foster '804, even in combination with Kawada '653, does not teach an embodiment as instantly claimed.

Accordingly, the requisite motivation and/or reasonable expectation of success is lacking such that a *prima facie* case of obviousness has not been established. *Vaeck; supra*. Reconsideration and withdrawal of this rejection in view of Kawada '653 and Foster '804 are respectfully requested.

Conclusion

A full and complete response has been made to all issues as cited in the Office Action. Applicants have taken substantial steps in efforts to advance prosecution of the present application. Thus, Applicants respectfully request that a timely Notice of Allowance issue for the present case.

Application No. 10/606,894

Docket No.: 0171-0983P

Art Unit 1756


Reply to Office Action of May 15, 2006

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez (Reg. No. 48,501) at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: August 15, 2006

Respectfully submitted,

By  _____

Andrew D. Meikle

Registration No.: 32,868

BIRCH, STEWART, KOLASCH & BIRCH, LLP

8110 Gatehouse Road

Suite 100 East, P.O. Box 747

Falls Church, Virginia 22040-0747

(703) 205-8000

Attorney for Applicant